The unintended consequence of an export ban: Evidence from Benin's shrimp sector

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Abstract

The inability of Benin to comply with EU standards led to a ban on its shrimp exports. We show that the ban had a negative impact on the income of fishmongers and fishermen, in the short run, but also several years after it was lifted. The impact persisted because exports to the EU did not revive and the local shrimp demand could not fully compensate for the loss of the EU market. A small number of local actors coped with the ban by moving out of the sector, but the large majority were locked in the local fishery sector.

Acknowledgements

We thank Benoit Adeke, Elena Briones Alonso, Koen Deconinck, Mathias Hungerbuhler, Nik Stoop, Jo Swinnen, Sylvain Tossou and Anneleen Vandeplas for useful comments. We also benefited from very useful comments from the editor and referees of this journal. Finally, we thank participants at seminars, conferences and workshops in Leuven (KULeuven), Namur (CIFOP Conference), Oxford (CSAE conference), Berlin (DIW), and WTO (SPS Workshop). This research was funded by LICOS' Methusalem Grant, and by the Fund for Scientific Research – Flanders (FWO-Vlaanderen).

1. INTRODUCTION

The WTO agreements on sanitary and phyto-sanitary standards in 1995 coincided with important changes in the food safety and quality standards of major food importing economies (e.g., the EU, the USA and Japan). More food standards were being imposed that apply to more products and to more substances. The standards have also become tighter, and full traceability is required through Hazard Analysis Critical Control Points (HACCP[1]). Furthermore, there are now more internal and border controls, which increase the probability of detection of non-compliance (European Commission, 2009).

While these measures are likely to have achieved their primary objective of improved consumer-health protection in developed economies (e.g., Golan et al., 2000), they have come at a cost as producers need to devote additional financial and human resources to complying with them. These additional costs have raised concerns that standards may act as barriers to trade for those countries and small-scale producers with relatively few resources and limited expertise (e.g., Athukorala and Jayasuriya, 2003; Garcia Martinez and Poole, 2004; Gibbon, 2003; Henson, and Loader, 2001; Kherralah, 2000; Reardon et al. 1999; Key and Runsten, 1999; Farina and Reardon, 2000; Unnevehr, 2000).[2]

Besides additional costs, producers are also facing new risks, including withdrawal of their product from the market, rejection of exports at the border, destruction of shipments, or, in the worst case – an outright export ban on all products from the company or the sector involved (e.g., Batz and Morris, 2011). Several papers have looked at case studies of such worst case scenarios, investigating the impact of an export ban triggered by non-compliance with food standards (e.g., Alavi, 2009, Dey et

al., 2005, Yunus, 2009, Cato and Santos, 2000, Calzadilla-Sarmiento, 2002, Keizire, 2004; UNIDO, 2002). While most of these studies document huge compliance costs and thus negative short-run effects when the ban is imposed, they also show a revival of the export market when the ban is lifted, and in general find that the upgrading of the sector lead to positive medium- and long-run impacts.[3]

This paper adds to this literature with an in-depth case study of the impact of the ban on shrimp exports from Benin, triggered by the failure to comply with EU-food safety standards. The ban[4] was introduced in July 2003 and lasted for almost two years, being lifted only in February 2005. Export failed, however, to revive. We give the reasons for this failure, and study the short and medium-run effects of this shock on the small-scale actors in Benin's shrimp supply chain (fishermen and fishmongers). Our study diverts from the existing body of research in two ways. First, we examine a case in which the export sector did not resume, even after the ban was lifted. Second, we evaluate the impact of the ban not only in terms of sector-level export performance but also on the basis of a welfare analysis at the level of small-scale producers. In this analysis we document the income effect of the ban and how it is determined by fishermen and fishmongers' access to coping strategies.

Through this analysis, our paper connects to a second strand of literature that examines household coping strategies in the context of negative shocks, ranging from rainfall shocks, to natural disasters, war, illness, financial crises, market liberalization and various international trade shocks (e.g. Beegle et al., 2006, Dercon, 2004, Duryea et al., 2007, McKenzie, 2003, Orr and Mwale, 2001, Skoufias, 2003, Varangis et al., 2003, Verpoorten, 2009). This literature documents that, when faced with a non-negligible

adverse income shock, households in developing countries resort to a wide range of coping strategies in order to smooth consumption, including self-insurance through dissaving, increased labor effort, migration and mutual insurance. The choice of strategy depends on the size and the type of the shock (e.g. Dercon, 2004).

The export ban of Benin can be characterized as a covariant and highly persistent shock, i.e., many households within the same community were negatively affected at the same time and the shock was not limited to one point in time. Looking at the impact of such a shock among fishermen is a timely contribution. Due to the intrinsic product-specific sanitary risk, the fishery sector is profoundly affected by the EU food safety standards. For instance, data from the Rapid Alert System for Food and Feed (RASFF[5]) indicate that fishery products (fisheries and crustaceans) account, on average, for the largest share of notifications among all imports of food and feed products (42% in 1995-2011) and the second largest share for borders refusals (43% in 2008-2011). How well can fishermen communities cope with such risks?

The next section presents the background of this study. Section 3 studies the impact of the ban on small-scale actors, first in an open-economy supply-demand model, then relying on survey data collected by the authors. Section 4 contains discussion and concluding remarks.

2. BACKGROUND

First, we give an overview of Benin's shrimp supply chain. Then, we present a narrative account of the ban and its aftermath.

2.1 Benin's shrimp export sector

The main shrimp specimen in Benin is *Penaeus duorarum burkenroad*,[6] which migrates from the sea to inland waters to mature and (when not caught in the inland waters) returns to the sea after having reached adult size.[7] The shrimp are mainly caught in the southern lakes of Nokoué and Ahémé and in the lagoon of Porto Novo.[8] Shrimp fishing is a seasonal activity that takes place during an 8-month period, from January, when the shrimp migrate to the inland waters, to August, when they return to the sea. The stock of inland shrimp available to fishermen fluctuates between years with rainfall playing an important role by determining the amount of nutrients in, and the salinity of, the water.

The inland fisheries of Benin are dominated by artisanal fishermen (male, with a few exceptions), who use small wooden canoes. After being caught by the fishermen, fishmongers (mostly the fishermen's wives) collect the shrimp on the water from the canoes or at numerous landing sites and sell them directly to local consumers, to other intermediate traders, or to the collectors recognized by the exporting firms. In the last case, the shrimp are sent by vehicles fitted with isothermal containers to the exporting plants.

Before the imposition of the ban in July 2003, there were three exporting firms: CRUSTAMER, SOBEP and SFG. During the ban none of the three could operate. Following the lift of the ban in February 2005, CRUSTAMER and SFG re-opened but

stopped exporting shrimp a few months later. In 2005, a new firm called DIAX entered the market. It is the only firm operating at the moment (October 2014), even though with frequent interruptions because of financing problems. DIAX is a relatively small firm that specializes in the export of fresh langoustines, fish and shrimp. The other companies mainly exported frozen shrimp. For instance, the shrimp purchased by the largest company, CRUSTAMER, were peeled, frozen at –45° C, and exported mainly to Spain from where they are further distributed to other European countries (Colette, 2003).

Figure 1 gives an overview of the actors along the supply chain of inland shrimp. In addition to the three actors mentioned above, the overview includes two additional ones: the banks that provide the exporting firms with credit and the Directorate of Fisheries, which is the competent authority that controls and regulates fisheries in Benin.

FIGURE 1 HERE

The shrimp sector represents an important source of employment in Benin. It has been estimated that, in 2002 (prior to the ban on export to the EU), the sector provided income to 45,000 fishermen, 18,500 female intermediate traders, 150 collectors recognized by the exporting firms, and 50 permanent employees and 1,200 seasonal employees (mostly women) of the exporting firms (BTC, 2007; Le Ry et al., 2007). In total, the shrimp sector created employment for 64,900 people, and so, when dependents are included – contributed to the livelihood of about 250,000 people in Benin or about 4% of the population.

In 2002, approximately a third of the 3,000 tonnes of shrimp caught on the three most important inland waters of Southern Benin (Lakes Ahémé and Nokoué and the Laguna of Porto Novo) were designated for export of mainly frozen shrimp destined for

the EU market (BTC, 2007; Le Ry et al., 2007). The remaining 2,000 tonnes, usually of a smaller size and lower quality (in function of their freshness, cleanness, size and color) were dried, smoked or cooked and consumed locally.

Figure 2 shows shrimp-export data from Benin and West Africa, the year of the ban being indicated with a vertical grey line. The left Panel shows that, upon the 2003 export ban, shrimp exports from Benin to the EU completely collapsed and remained close to zero even after the ban was lifted in 2005. That the collapse of Beninese exports is related to the export ban, and not to a supply shock due to some natural phenomena affecting the regional shrimp stock is supported by the right Panel of Figure 2, which shows that shrimp exports from other West-African countries to the EU remained relatively stable throughout the period.

FIGURE 2 HERE

2.2 A narrative account of Benin's export ban

This narrative account is largely based on semi-structured interviews we conducted in 2009-2013 with the exporting firms, fishmongers, government staff, donors, and credit managers in the banking sector.

2.2.1 The ban

In August 2002, Spain sent a notification to the RASFF about the presence of a high proportion of bacteria (*enterobacteriaceae*) and micro-organisms (*aerobic mesophiles*) detected in a sample of frozen shrimp imported from Benin. Following this notification, the EU Food and Veterinary Office (FVO) conducted its first inspection of Benin's shrimp sector in October 2002.

The inspection report pointed to the following six main deficiencies (EU DG SANCO, 2003): (1) shortcomings in Benin's legislation with respect to hygiene and the control of fishery products; (2) lack of human resources at the competent authority; (3) lack of EU-accredited laboratories to monitor the safety norms applied to shrimp; (4) the non-conform use of chlorine and additives by exporting firms; (5) the non-application of HACCP in exporting firms; and (6) bad practices with respect to hygiene and the environment at the level of the fishermen and fishmongers. Among others, this last deficiency refers to the practice of fishermen keeping the shrimp on the surface of their wooden canoes instead of preserving them in isothermal containers with ice.

Given these deficiencies, the FVO suggested that the Beninese government suspend its fishery exports to the EU and correct them. Not doing so would increase the risk of an official EU ban on Benin's fishery exports (SFP, 2003). Hence, following the decision of the Beninese Minister charged with fisheries, the self-imposed ban on exports was signed on July 11, 2003.[9]

Since the shrimp season extends from January to August, the exporting firms had large quantities of frozen shrimp in stock when the auto-suspension was signed. The FVO requested that 189 tons of shrimp be destroyed (Le Ry et al., 2007). More importantly, the entire export sector was officially put on non-active for almost 20 months until the ban was lifted.

2.2.2 Aftermath of the ban

The ban was lifted in February 2005 following significant improvements in conforming to the EU safety norms. In particular, the government updated the legal codes, provided

trainings on sanitary issues to small-scale actors, strengthened the Competent Authority, and upgraded three laboratories. The exporting firms resolved the nonconformities and adopted the HACCP system (UNIDO, 2010).

One of the biggest challenges was ensuring the traceability and responsibility of all the actors along the chain. Since 2004, the EU regulations have required auto-controls at all levels of the supply chain rather than leaving the control up to a central laboratory. In order to enable fishermen to respect safety norms and collectors to control the quality of shrimp purchased, facilities were constructed, which included the transformation of rudimentary landing sites into *transfer platforms* (TP) for receiving, selecting and rinsing shrimp before putting them in isothermal containers with ice.[10] In addition to the TPs, *control units* (CU) were established to sample loads of shrimp for quality control. These improvements were to a large extent financed by the donor community and implemented in collaboration with the Beninese government agencies and other local actors. Furthermore, donor and government institutions have organized training sessions to raise awareness of small-scale actors about the ban and about what is expected from them in order to comply with standards

Thanks to these efforts, Benin made it to List 1 in December 2009, which gives a select number of "harmonized" or "approved" countries that are allowed to export fishery products to all EU countries without being subject to additional legislation on the part of individual EU countries.[11] However, as we write (October 2014) the sector has yet to recover from the ban.

An analysis of the failure to restart export can been found in Houssa and Verpoorten (2013) where we argue that shrimp exports did not revive because local and

international institutions failed to resolve the sector's inadequate financial, human and institutional capacity, and therefore its increased perceived riskiness among bankers and exporters. Despite the improvements made, there was insufficient domestic capacity building to allow the country to keep up with rapidly evolving EU food safety norms. The high product-specific sanitary risk in a context of poor “hard” and “soft” infrastructure scares investors. For instance, better regional infrastructure could have enabled firms to source shrimps from a larger area, allowing them to cover the additional (fixed) costs triggered by standards. Alternatively, better-functioning contractual institutions, and more co-operation, information exchange and trust among the inter-dependent actors in the supply chain, could have helped exporters to aim for quality labels, of which the price premium would have covered the increased costs.

3. IMPACT OF THE BAN

We employ two complementary approaches to analyze the short and medium-run effects of the export ban on small-scale actors. First, we discuss these effects within an open-economy supply-demand model for shrimp. Second, we rely on survey data to examine the impact of the ban as well as the coping strategies used by the small-scale actors. The model allows us to trace the mechanisms through which the ban affects small-scale producers. The survey complements the model, as it allows us to study the reactions of the producers.

3.1. The ban's impact in an open-economy supply-demand framework

We model the market for fresh shrimp in Benin, focusing on the involvement of three main actors: (i) fishermen; (ii) local consumers in Benin and in neighboring countries; and (iii) the exporting firms.[12]

Fishermen supply two qualities of shrimp: high and low. The high quality shrimp is characterized by its larger size and pink color. Exporting firms buy only the high quality, whereas local consumers may buy both high and low quality shrimp. A premium is paid for the high quality. Because exporting firms sell at the world market, they can afford paying a higher premium for high quality shrimp than domestic consumers. Moreover, export demand for shrimp is perfectly elastic, assuring daily market clearance for the fishermen. This market segmentation implies three, different but, interrelated segments of the Benin's shrimp supply chain: i) the domestic market for low quality shrimp; ii) the domestic market for high quality shrimp; and iii) the export market for high quality shrimp.

We integrate these features into the standard open-economy, supply-demand framework (e.g., Baldwin and Wyplosz, 2009 and Krugman et al., 2011) and demonstrate the impact of the export ban on exporting firms and small-scale actors. See the Appendix and Figure A for details.

The model predicts the following impacts of the ban. In the short-run the ban generates a loss to fishermen due to the decrease of both the world market demand and price paid for high-quality shrimp. Local consumers derive a welfare gain from the ban as they are now able to buy high quality shrimp, but – as can be seen in the supply-demand

diagram - this gain is less than the loss of the fishermen's producer surplus. Moreover, as good quality shrimp are now supplied to the local markets, the demand for its substitute (bad quality shrimp) shifts to the left, leading to a further reduction of the welfare of the fishermen (see Panel b of Figure A).

In the medium run the situation of fishermen does not significantly improve as the exports to the EU did not revive, and its loss was only partly compensated by an expansion of the regional market (see Panel c of Figure A). While our interviews with intermediate traders revealed that the regional market for good-quality shrimp expanded since the ban, with increased sales to neighboring countries (Nigeria, Togo, Gabon and Ghana), the traders also noted that this increase could not compensate for their loss of the EU export market; partly because of the high transaction costs in the forms of border taxes and the poor transport infrastructure to the regional markets. They also complained about price fluctuations in these markets and the lack of timely payment (for the latter point, see also Allegre and Dupret, 2010).

Overall, the model predicts a persistent negative income shock for small-scale actors in the fishery sector. How do the small-scale actors react? Can they curb the negative impact?

3.2 Evidence from a survey among fishermen and fishmongers

While the ban implies a decline of the producer surplus *in the fishery sector*, in the longer run, a number of small-scale actors may compensate this loss with income from other activities. To assess whether fishermen and fishmongers face persistent income losses,

we study their income and activity portfolio changes on the basis of data from a survey that was undertaken in 2009, six years after the imposition of the ban. We start by presenting the sample of small-scale actors that were part of our survey.

3.2.1 Data used

The households that are part of our survey were selected from the 2006 fishery census, which recorded information on 27,568 small-scale actors, mostly fishermen and fishmongers, operating in the fishery sector of southern Benin. We took a random sample of 540 households, stratified geographically across 18 villages that are part of three administrative communes located on the three lakes: Lake Nokoué (So-Ava Commune), Lake Ahémé (Kpomasse Commune) and Lagune de Porto-Novo (Aguégués Commune). Within these households, we selected 516 fishermen and 394 fishmongers (mainly the fishermen's wives) for individual interviews. The location of the three communes and lakes is shown in Figure 3.

The communes differ in a number of aspects that are likely to play a role in the heterogeneous impact of the ban across the lakes. So-Ava, located on the largest lake, is the most remote commune. It harbors many traditional fishing villages, built on the water, resulting in pollution from human waste and therefore lower quality of shrimp with respect to the EU standard. Aguegues, located at the medium-size lake, is the least remote commune and provides shrimp of intermediate quality. Kpomasse is located furthest from the exporting firms at the smallest lake, but it can easily be reached across land. It was the preferred supplier of the exporting firms because of its highly appreciated quality of shrimp (reflected in a larger size and more reddish color of the shrimp). Because of this

reason, we expect fishermen at Kpomasse to be most affected by the ban. In contrast, we expect fishermen at So-Ava to be least affected by the ban, given the commune's remoteness and its inferior quality of shrimp

FIGURE 3 HERE

The household members were interviewed in the period March-July 2009, during the 2009 shrimp season, by the authors of this paper and a team of 30 enumerators and 4 supervisors. In order to collect accurate information on income and consumption, the households were visited every two weeks. During each of these visits, income and consumption data were recorded. In addition, a standard household module was implemented covering different topics at each visit, such as social capital, credit, annual income and economic activities, shocks and coping strategies, health and education. From the data, we found that household income in 2009 stemmed for more than 80% from the fishery sector of which 30% was accounted for by the shrimp subsector.

During the first survey visit, the fishermen and fishmongers were asked to share their experiences regarding the ban. The following open questions were asked[13]:

(i) Are you aware that there has been a ban*? (If no: go to the next section)*

(ii) In your opinion, what was the cause of the ban?

(iii) What impact did the ban have on your income immediately after the ban (in 2003) and today (in 2009)?

(iv) What explains this impact?

(v) *If the impact was negative*, how did the household react to cope with it, immediately after the ban (in 2003) and today (in 2009)?

3.2.2 Awareness about the ban and its cause

We study the impact of the ban only for the subsample of small-scale actors that knew about the ban at the time of the survey. Table 1 shows that 744 out of 910 (82%) fishermen and fishmongers knew about the ban. This proportion varied across the communes. In So-Ava, the commune that is most isolated and was supplying the lowest quality of shrimp, only 68% of the fishermen and fishmongers were aware of the ban. In Kpomasse and Aguegues, 81% and 97% of the fishermen and fishmongers knew about the ban. The variation across communes suggests that awareness is nonrandom, and our subsample of respondents to questions (ii)-(v) is thus specific. More precisely, awareness is likely to be higher for fishermen who supplied shrimp to the exporting firms. Since these fishermen are also likely to be more affected by the export ban, the results of our subsample analysis on the impact of the ban should be interpreted as an upper bound of the ban's impact on the fishermen communities.

While most of the small-scale actors knew about the ban, the awareness about the actual cause of the ban was relatively low, despite trainings received.[14] Regarding question (ii), about the cause of the ban (asked to those who knew about the ban), only 40% of the fishermen and 45% of fishmongers report as a cause that "the food safety norms were not sufficiently respected"; while 20% said they had no idea why. In the remaining 30% to 40%, the answers varied widely, including "the Europeans no longer had money", "the firms went bankrupt", "the local authorities were arguing", "the European who bought the shrimp is on a holiday", "we need to provide food to Beninese markets (instead of European markets)", "it is because of the use of prohibited fishing gears" and "the Houedah are behind it".[15] The knowledge about the cause of the ban was

highest in Kpomasse, at 61%, compared to 38% in Aguegues, and 26% in So-Ava. Again, this variation suggests that those better informed about the ban are those who were more involved in the shrimp export supply chain.

TABLE 1 HERE

3.2.3 The self-reported income effect of the ban

Table 2, Panel A summarizes the responses to question (iii) on the self-reported income effect of the ban in 2003. Close to 59% of the respondents reported a *very* negative impact in the short run, and 26% report a *rather* negative impact. Approximately 9% reported no impact, and about 5% mentioned a positive impact. Corresponding well with its status as preferred supplier to the exporting firms, Kpomasse had the highest proportion of actors mentioning a strongly negative impact (84%), followed by Aguegues (56%) and So-Ava (33%).

When asked about the reason for the negative short-run impact of the ban (question iv), more than 70% of those who reported a negative impact attributed it to “a low price because of lack of purchasers”. This is consistent with the price decrease that features in the model presented in Section 3.2.1. Other reported reasons are diverse and include “the market is far”, “it is complicated now that we have to sell to Togolese, Gabonese and Nigerian markets”, or “we have to throw away the shrimp or smoke them for lack of buyers of fresh shrimp”.

Among the 5% who reported a positive impact, the reason mentioned is “new market opportunities”. From our interviews, we learned this was the case for relatively large intermediate traders who increased their interactions with markets in neighboring

countries. This suggests that the ban on exports to Europe thus opened the way for increased regional trade, be it to the benefit of a selected number of intermediate traders.

TABLE 2 HERE

What about the ban's impact in the medium run? Panel B of Table 2 summarizes the self-reported assessment of the ban's impact in 2009, 6 years after the imposition of the ban. Up to 52% of the local actors still reported a very negative impact, and 30% reported a rather negative impact. The most frequently cited reasons for the persistent negative effect were the persistently low price and the difficulty of selling in distant markets.

We expect the ban's income effect to be more negative for small-scale actors that were involved in the shrimp export supply chain at the time of the ban. To verify this, we turn to a multivariate regression analysis. Our dependent variable is an indicator variable taking one if the self-reported impact of the ban was very negative (and zero otherwise). We construct this variable both for the immediate effect in 2003, and for the medium-run effect in 2009. As our explanatory variable of interest, we include an indicator variable on the actor's involvement in the shrimp sector in 2003; and we control for years of schooling and lake fixed effects. The results in Table 3 show that, in the short run, the impact of the ban was more negative for shrimp fishers. Interestingly, in the medium run, there is no significant difference of the ban's impact on shrimp and fish fishers.[16] A study of coping strategies can shed light on this result.

TABLE 3 HERE

3.2.4 Coping strategies

To understand how the small-scale producers in our sample reacted to this shock, we study their answers to question (v): "If the impact was negative, how did the household react to cope with it immediately after the ban (in 2003) and today (in 2009)?"

The answers are summarized in Table 4. Given that the shock was covariant and persistent, it is not surprising that the households in our sample rarely reported mutual insurance ("asking for help from friends and family") as a coping strategy, while "developing another activity" was more frequently reported. Other coping strategies were "no reaction", "consume less", "selling assets", "take consumption credit", "work more hours", and – to a lesser extent - "take child(ren) out of school". Much less frequently reported coping strategies are pooled in the category "other", and include among others "reduce the number of children" and "migrate to Nigeria".

TABLE 4 HERE

A number of these coping strategies reduce the household's capital, be it physical or human. While contributing to consumption smoothing in the short run, such strategies may negatively affect income in the longer run. The most viable coping strategy when faced with a prolonged negative demand shock for shrimp would be to switch to another activity. This conjecture finds support in the data. Among the 63 fishermen who reported having switched activities following the ban, 39% reported a very negative impact of the ban in 2009 compared to 60% of all fishermen, and 73% of fishermen reporting the coping strategies "no reaction", "asset sale", and "consume less". For fishwives, we find similar results. The 51 fishwives who changed activities reported a very negative impact in 33% of cases compared to an average of 53%.

To investigate the effectiveness of an activity-portfolio change further, we analyze data from a module on economic activities asking fishermen about their economic activities in 2002 and in 2009. Among the 63 fishermen who self-reported having switched activities following the ban, the large majority (77%) remained in the fishery sector, switching to fishing fish (instead of shrimp). Thus, they ended up competing with other fishermen for the scarce fishery stock, which may explain why – in the medium-run – fish fishers suffered no less from the ban than shrimp fishers (as was shown in Column 3 of Table 3). Only 14 fishermen who changed activities between 2002 and 2009 (23%) switched to activities outside the fishery sector, mainly petty trade, livestock raising and agriculture. These fishermen reported a very negative income effect of the ban only in 29% of cases compared to 42% for those who switched activities within the fishery sector, which suggests that switching to the non-fishery sector was the most effective coping strategy.

We verify this result in a regression analysis in which we regress an indicator variable taking one if the self-reported medium-run impact of the ban was very negative on indicator variables of income diversification, inside and outside the fishery sector (taken from the survey module on economic activities). We control for years of schooling and being a shrimp fisher or trader at the time of the ban, as well as lake fixed effects. The results, given in columns 1-2 of Table 5, confirm that diversification outside the fishery sector strongly decreases the probability of a very negative income effect of the ban in 2009.

One could object that the choice to move out of the fishing sector is endogenous, in which case our result may not reflect the successfulness of this diversification strategy,

but rather an unobserved characteristic of the small-scale actor that correlates both with diversification and the impact of the ban. For instance, a fisherman that has an extensive social network, may suffer less from a negative income shock (e.g. though informal insurance) and be able to use his network to enter into other economic activities. However, if such spurious correlation would be driving our result, we would expect diversification to be also related to the immediate impact of the ban (in 2003). In a falsification test, reported in columns 5 and 6 of Table 5, we find that this is not the case.

TABLE 5 HERE

In sum, the persistence of the self-reported negative welfare impact suggests that the domestic and regional demand did not succeed in substituting for EU demand even after considerable time. It also indicates that most small-scale actors were unable to fully cope with the drop in shrimp demand by substituting shrimp fishing and trading with another activity, which would be the coping strategy *par excellence* for dealing with a persistent covariant shock. Among those who diversified, most diversified within the fishery sector, ending up competing with fish fishers and fish traders who were not engaged in the shrimp sector at the time of the ban. This competition may explain why, in the medium-run, the negative effect of the ban was equally strong for fish fishers.

That the relatively successful coping strategy of diversification to the non-fishery sectors was used by only a handful of local actors suggests that access to these other sectors is constrained. In a related study on the determinants of income diversification in the fishing communities of southern Benin, we explain the low degree of income diversification among fishermen in terms of the remoteness of their communities, the

difficulty of access to agricultural land, and the lack of schooling with close to 70% of active adults being illiterate (Stoop et al., 2013).

3.2.5 Migration

Our qualitative fieldwork revealed that, while the emigration of entire households is uncommon, the emigration of household members – especially to similar fishing grounds in Nigeria - is rather common. The fact that migration was only mentioned as a coping strategy by two of our respondents is likely to stem from selection bias; those who migrated had lower chances ending up in our sample. This selection bias may not only bias the coping strategies that we recorded, but also the reported income effect of the ban, with the direction of the bias depending on whether migrants were more or less successful than non-migrants in coping with the ban.

To gauge the extent of migration and its potential bias, we turn to the 2009 survey module that included the household roster. Of the 1871 household members aged 15 to 65, 131 or 7% were reported to be temporarily absent. Among the absent members, 72 left for work purposes. Among those, 41 were reported to be working in the fishery sector in Nigeria.

We did not have the means to track these migrants and find out whether they successfully coped with the ban's income shock. But, in case they did, some of their success may have spilled over to other members of their household that remained in Benin. Hence, we tentatively explore the effect of migration by comparing fishermen in our sample with and without household members fishing in Nigeria. Adding the number of temporary work-related migrants to our regression model, the estimated coefficient on

this variable is found to be negative and significant (at the 10% level), suggesting that temporary migration reduced the ban's negative income effect in the medium-run.

Again, one could object that this result is driven by endogeneity, i.e. some unobserved factor driving the correlation between migration and the ban's moderate impact. We therefore turn again to a falsification test. The last two columns of Table 5 show that the number of temporary migrants is unrelated to the immediate effect of the ban in 2003, reducing the concern that we pick up a spurious correlation between the effect of the ban and migration.

In sum, this finding suggests that migration may be a relatively successful coping strategy, and that, since migrants are largely excluded from our subsample, we may have overestimated the negative impact of the ban. Nevertheless, even in the subsample of households with temporary migrants, 42% reported a very negative medium-run income effect of the ban, suggesting that migration would not entirely cancel out our result of a negative income effect of the ban.

5. DISCUSSION

Benin's shrimp sector collapsed upon the 2003 export ban, and the sector did not revive, despite the lift of the ban in 2005. Some of the factors that underlie the failure of exports to revive, notably the poor "hard" and "soft" infrastructure, also constrain the way small-scale producers can cope with the negative income shock, and therefore its welfare implications.

What are the welfare implications of the ban at the level of small-scale producers? This paper points out that the ban had a large and persistent negative impact on the

income of fishermen and fishmongers. The access to markets of rich countries translated into a perfectly elastic demand of exporting firms, assuring daily market clearance as well as a price premium for the fishermen. Being small, much poorer, and plagued by high transport and transaction costs and with limited access to inexpensive preservation technology, the domestic and regional markets could not take over this role. In addition, fishermen were constrained in their access to the non-fishery sector. As such, switching activities proved an accessible coping strategy for only a handful of fishers and was insufficient to compensate for the loss in producer surplus. Instead, shrimp fishers engaged in competition with fish fishers or intensified their shrimp fishing activity, thereby compromising the future fishery stock.

One lesson we can draw from these findings is that, in the face of a ban or another export market shock, policymakers and donor agencies should put in place safety net programs to mitigate the shock's negative impact on households (Skoufias, 2003; Grosh et al. 2008). Such safety nets may safeguard households from seeking recourse to coping strategies that have long-term negative effects, such as depleting assets or withdrawing children from school. At the same time, there should be support for those household coping strategies that are viable in the longer run and do not inflict negative externalities on other households in the same community (such as overfishing). In the case of the fishing communities, this means supporting common pool resource management and income diversification outside the fishery sector, e.g. through micro-credit schemes and training programs. A more general lesson one can draw from the case of Benin's shrimp sector is that, besides safety nets upon shocks, what needs to be built is domestic capacity that will enable export sectors and small-scale producers to confidently manage risk and

deal with shocks. This will involve addressing root causes rather than symptoms, through firm political commitment rather than fragmented donor efforts.

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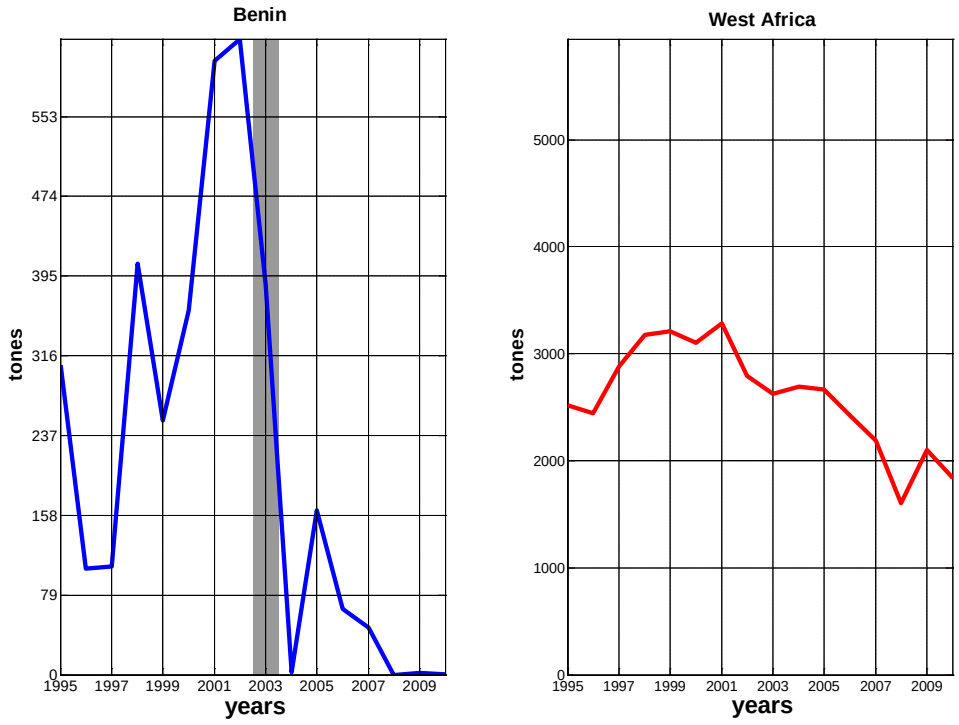


Figure 1:

Shrimp exports from Benin and West-Africa to the EU

Note: the West African data are obtained as a simple average of the following five countries: Cote d'Ivoire, Ghana, Nigeria, Senegal, and Togo. The grey area shows the year of the EU ban.

Sources: Data is taken from BACI database, which present the UN Comtrade database in a consistent way; see http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=1, November 10, 2013

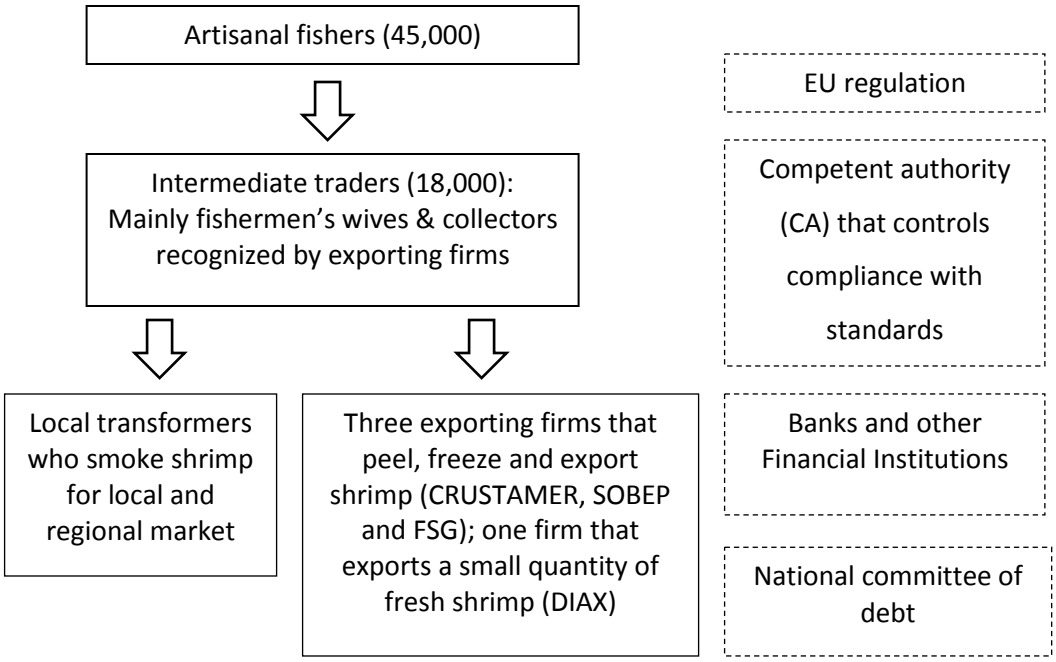


Figure 2:
Benin's inland shrimp supply chain
Source: Our own compilation of information from several reports (e.g., SFP, 2003 and EU-DG SANCO, 2003)

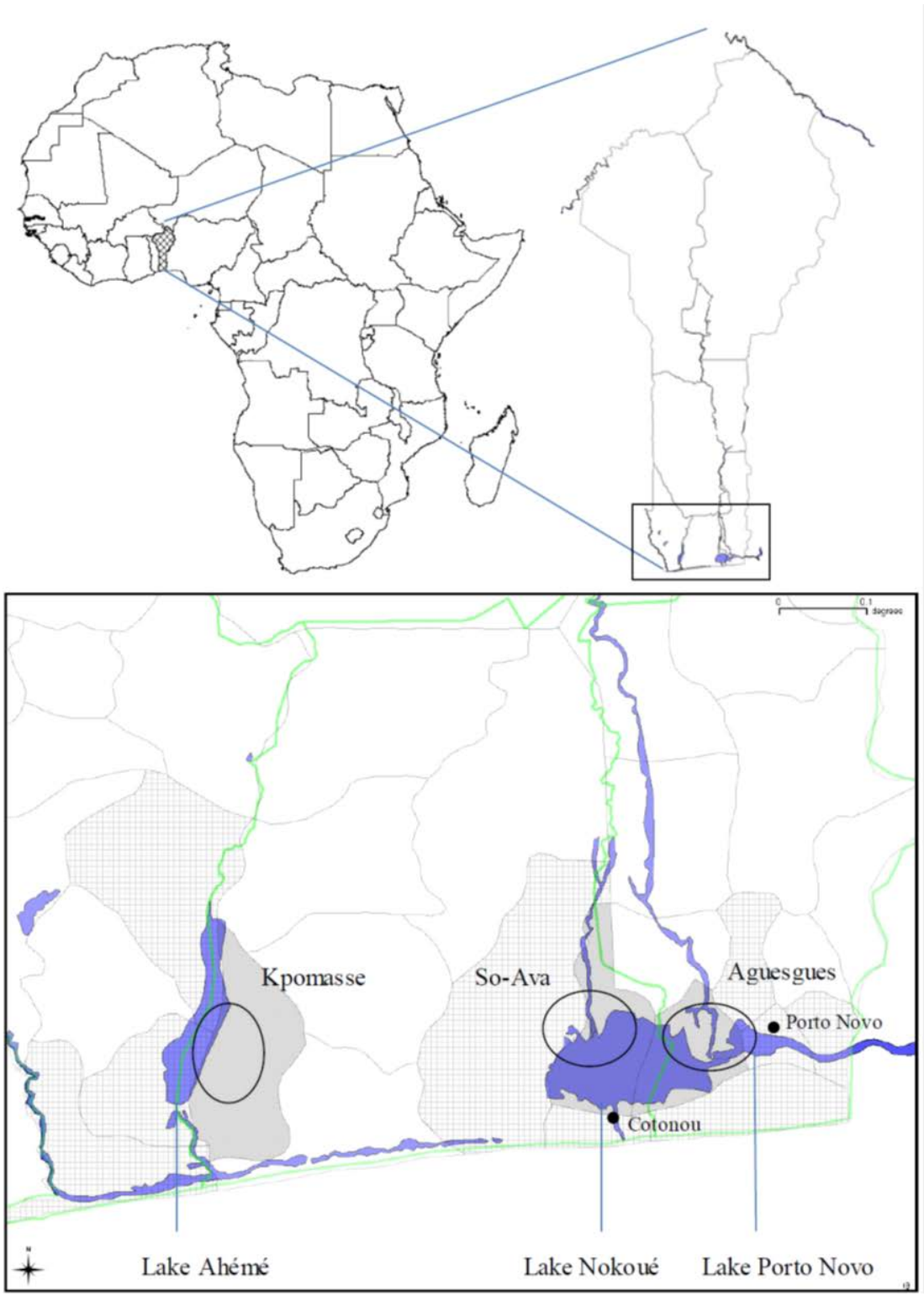


Figure 4:
Map of survey area
Note: Kpomasse lays at Lake Ahémé, So-Ava at Lake Nokoué and Aguegues at the intersection of Lake Nokoué and Lagune de Porto-Novo

Table 1: Awareness about the ban and its cause

	Total	Fishermen	Fishmongers	Kpomasse	So-Ava	Aguesgues
			"Are you aware that there has been a ban?"			
Yes (%)	82	82	82	81	68	97
Obs	910	516	394	299	306	291
			"What is the cause of the ban?" (correct answer: "The food safety norms were not respected")			
Correct answer (%)	42	40	45	61	26	38
Obs	744	422	322	241	209	291

Source: household survey conducted in 2009 by the authors of this paper.

Table 2: Self-reported assessment of the impact of the export suspension

Panel A: short-term (impact in in 2003) (%)						
	Total	Fishermen	Fishmongers	Kpomasse	So-Ava	Aguesgues
Strongly negative	59	57	60	84	33	55
Rather negative	26	26	26	10	56	18
No impact	9	11	6	2	8	15
Rather positive	4	4	5	1	0	10
Strongly positive	1	0	2	2	0	1
I don't know	1	1	1	1	3	0
Panel B: medium-term (impact in 2009) (%)						
	Total	Fishermen	Fishmongers	Kpomasse	So-Ava	Aguesgues
Strongly negative	52	51	53	66	36	51
Rather negative	30	29	31	22	40	29
No impact	11	13	9	8	9	16
Rather positive	4	5	4	2	10	2
Strongly positive	1	1	1	1	1	0
I don't know	2	2	2	0	4	1
Obs	744	422	322	241	209	291

Source: household survey conducted in 2009 by the authors of this paper.

Table 3: Determinants of the ban's income effect, short-run and medium-run

Dependent variable: very negative impact	Short run (2003)		Medium run (2009)	
	Fishermen	Fishmongers	Fishermen	Fishmongers
Years of schooling	-0.027	0.014	0.004	-0.070**
	(0.023)	(0.040)	(0.023)	(0.035)
Involved in shrimp sector in 2003	0.554***	0.285	0.226	0.299
	(0.211)	(0.283)	(0.204)	(0.275)
Lake fixed effects	Yes	Yes	Yes	Yes
Obs	422	322	422	322

Probit model estimation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Self-reported coping strategies upon the ban

	Fishermen				Fishmongers			
	2003		2009		2003		2009	
	Nr.	%	Nr.	%	Nr.	%	Nr.	%
No reaction	70	20	73	21	53	19	61	22
Asset sale	44	13	18	5	20	7	11	4
Consume less	61	18	56	16	61	22	43	15
Take consumption credit	31	9	24	7	24	9	30	11
Engage in other ec. act.	62	18	63	18	51	18	57	21
Work more hours	31	9	66	19	25	9	41	15
Take child out of school	23	7	10	3	6	2	8	3
Help from family or friends	12	3	14	4	23	8	14	5
Help from government or NGO	1	0	8	2	7	3	7	3
Other	13	4	16	5	8	3	6	2
Total	348	100	348	100	278	100	278	100

Source: household survey conducted in 2009 by the authors of this paper.

Table 5: Income diversification, migration and the ban's income effect

Dependent variable: very negative impact	Medium run (2009)				Short run (2003)	
	Fishermen	Fishmongers	Fishermen	Fishmongers	Fishermen	Fishmongers
Years of schooling	0.009	-0.063*	0.009	-0.063*	-0.029	0.015
	(0.023)	(0.035)	(0.023)	(0.035)	(0.023)	(0.041)
Involved in shrimp sector in 2003	0.249	0.232	0.186	0.229	0.503**	0.263
	(0.206)	(0.273)	(0.211)	(0.274)	(0.216)	(0.283)
Coping strategies 2009:						
Diversify into fish fishing or trading	0.001	-0.363	0.068	-0.357	0.286	-0.340
	(0.216)	(0.256)	(0.222)	(0.256)	(0.226)	(0.265)
Diversify out of fishery sector	-0.940***	-1.146***	-0.942***	-1.135***	0.260	-0.249
	(0.331)	(0.311)	(0.332)	(0.311)	(0.364)	(0.301)
Household members migrated for work			-0.252*	0.013	-0.034	-0.021
			(0.133)	(0.142)	(0.101)	(0.142)
Lake fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs	422	322	422	322	422	322

Probit model estimation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX: THE BAN'S IMPACT IN A SUPPLY-DEMAND FRAMEWORK

Section (a) models the main features of Benin's market for fresh shrimp before the ban, i.e., when the exporting firms were operating. Sections (b) and (c) illustrate the short-term and medium-term impacts of the ban, respectively. Our time frame for the short-run is the period under which the ban was in force, i.e., from July 2003 till February 2005; while the medium-run time frame stretches from February 2005 - when the ban was lifted – to 2009, when we conducted our fieldwork.

a) The Model and the situation prior to the ban

We make the following four assumptions. First, fishermen supply shrimp every day; q_b^d low-quality shrimp to local consumers and q_g^d and q_g^X high-quality shrimp to local consumers and exporting firms, respectively. The prices related to these quantities (q_b^d, q_g^d and q_g^X) are denoted by p_b^d, p_g^d and p_g^X where $p_b^d < p_g^d \leq p_g^X$. Second, as both the good and bad quality shrimp are caught with the same fishing gear, the supply curves of the two qualities of shrimp, denoted by S_g and S_b , are assumed to be identical. Each supply curve is a positive function of the shrimp price. Third, the supply is bounded by the available stock of shrimp in the lakes (which is exogenous in our model, although in reality depends on weather and environmental conditions as well as on past fishing intensity). We denote the stock of each quality of shrimp by ${q_b}^*$ and ${q_g}^*$, respectively.

The fourth assumption we make is that local consumers and fishermen are price takers, i.e., they cannot determine the *local market* price for shrimp. The exporting firms are price takers on the *world market* as they cannot determine their export price p_w. In the

local market, however, the handful of exporting firms set the price p_g^X at which they acquire shrimp from fishermen and buy at this price as long as they earn a markup ε equal to $p_w - p_g^X - c$, where c represents the expected marginal cost (including the costs of transporting, treating, freezing and packaging the shrimp as well as the cost of external financing from banks).[xvii] Thus, the demand curve of the exporting firms, D_g^X, is assumed to be perfectly elastic.

Figure A (a)-(c), summarizes our open-economy, supply-demand model for the market of fresh shrimp in Benin. Panel (a) presents the situation before the ban, i.e., at the moment when the exporting firms were operating. Panels (b) and (c) show the short-run and medium-run impacts of the ban, respectively. Each panel has three diagrams: the left and middle diagrams represent the domestic market for low and high quality shrimp, respectively, while the diagram on the right gives the export market for high quality shrimp.

FIGURE A HERE

In the right-hand diagram of Panel (a), exporting firms break even at the quantity q_g^X for which they pay a unit price p_g^X to the fishermen. For the same quality of shrimp, local consumers are willing to pay only p_g^d, $p_g^d < p_g^X$, (middle diagram of Panel (a)). As a result, fishermen sell all of their good quality shrimp to the exporting firms.[xviii] Under these assumptions and given the world price of shrimp p_w and operating costs c, exporting firms derive a profit represented by the purple area HIJK in the right diagram.

The producer surplus of fishermen has two parts: one related to their supply of the low quality to domestic consumers, which is represented by the green area ABp_b^d in the

left diagram; and the other is derived from the supply of high quality shrimp to the exporting firms given by the domain CEF in the middle diagram. The latter can be further split into two parts: the green area DEG represents what the fishermen would obtain if they sold all high-quality shrimp to local consumers, and the dark red area $CDGF$ represents the additional welfare fishermen obtain by selling a larger quantity at a higher price to exporting firms. The export regime is clearly beneficial for shrimp fishers.

The export regime represented in Panel (a) is not beneficial for local consumers as it deprives them of high quality shrimp. Their loss is represented by the area CDG in the middle diagram. Note, however, that the welfare gain of the fishermen under the export regime is much greater than the welfare loss of the local consumers. The area CFG represents this positive net welfare gain. Besides, the exporting firms also create employment and contribute to the foreign reserves of the central bank, adding to the overall positive welfare impacts of the export regime.

b) Short-run impacts of the export ban

Panel (b) illustrates the short-term impacts of the export ban. As shown in the right diagram, it causes the demand D_g^X from the exporting firms to shift down to zero. As a result, the profit of exporting firms disappears completely. In addition, but not shown in the figure, the firms have to suffer the loss due to the destruction of their stock and also have to lay off employees.

The ban also generates a loss to fishermen corresponding to the area $CDGF$ in the middle diagram. However, local consumers derive a welfare gain from the ban as they are now able to buy high quality shrimp. This gain, given by the area CDG, is less than the

loss of the fishermen's producer surplus. This is not, however, the end of the story. As good quality shrimp are now supplied to the local markets, the demand for its substitute (bad quality shrimp) D_b^d shifts to the left, leading to a further reduction of the welfare of the fishermen.

In sum: the ban is bad news, both for the exporting firms and the fishermen.

c) Medium-run impacts of the ban

In 2005 the export ban was lifted, but the firms did not resume activities. The reasons for this failure were discussed in detail in Houssa and Verpoorten (2013). Among the various reasons were the higher compliance costs faced by the firms. Their impact is illustrated in Panel (c). The diagram on the right shows that, in the medium-run (MR) after the ban, the exporting firms faced costs c^{MR}, which were significantly higher than the pre-ban cost c.

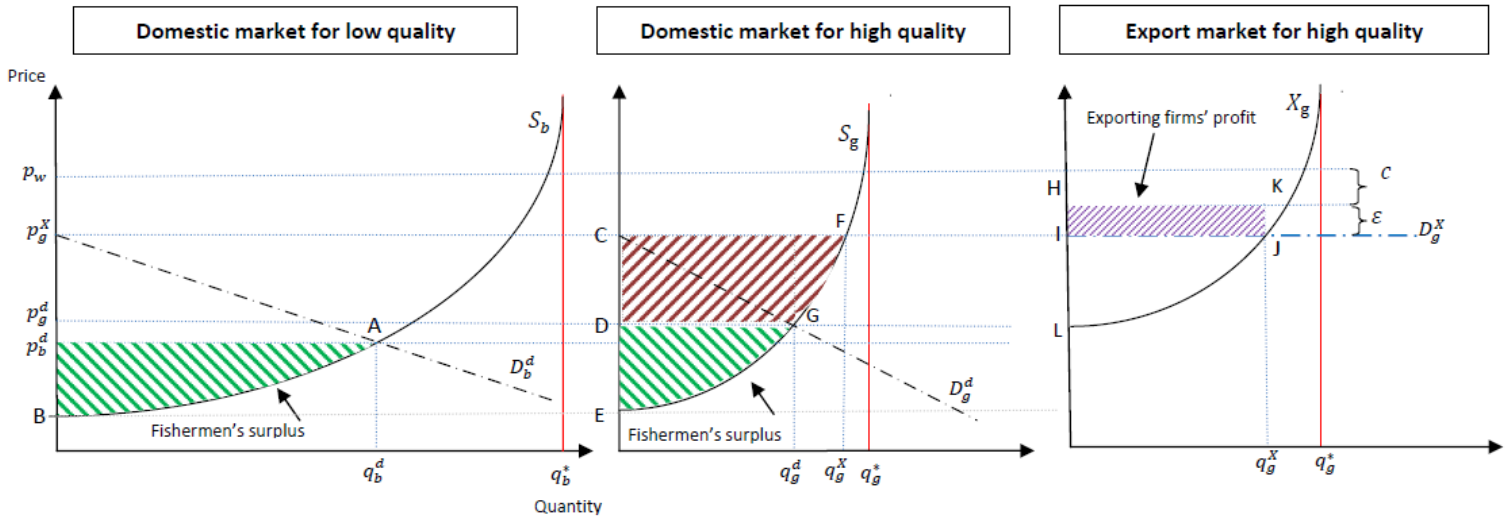
Keeping the export price p_w and the markup ε fixed, these additional costs imply that the firms will only operate when they can purchase shrimp at a lower price $p_g^{x^{MR}}$. However, if $p_g^{x^{MR}}$ is less than the local market price $p_g^{d^{MR}}$, then all the good-quality shrimp will be sold locally. This scenario, depicted in the middle and right diagrams of Panel (c), corresponds to the information received during our field trip.

Our interviews with intermediate traders revealed that the local market for good-quality shrimp expanded since the ban, with increased sales to neighboring countries (Nigeria, Togo, Gabon and Ghana). This expansion led to a price increase in the local markets, such that $p_g^{d^{MR}} > p_g^{x^{MR}}$ (see the middle diagram). However, the traders also noted that this increase could not compensate for their loss of the European export

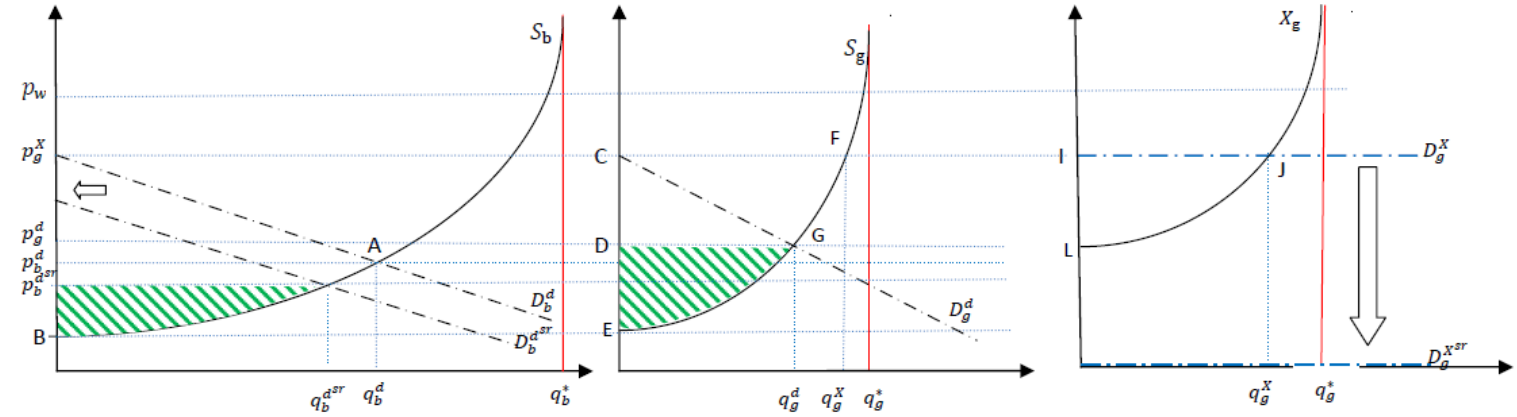
market; partly because of the high transaction costs in the forms of border taxes and the poor transport infrastructure to the local markets. They also complained about price fluctuations in the local markets and the lack of timely payment (for the latter point, see also Allegre and Dupret, 2010).

In sum: increased costs and evolving competition in the local (and international) market in the aftermath of the ban, led to a reduction of the profitability of exporting firms, and therefore to a failure to restart export activities.

a) before the export ban



b) **Short-term impacts of the ban**: export demand and shrimp prices collapse; fishing intensity increases



c) **Medium-run impacts of the ban**: domestic demand expands but limited; at high costs export firms cannot break-even

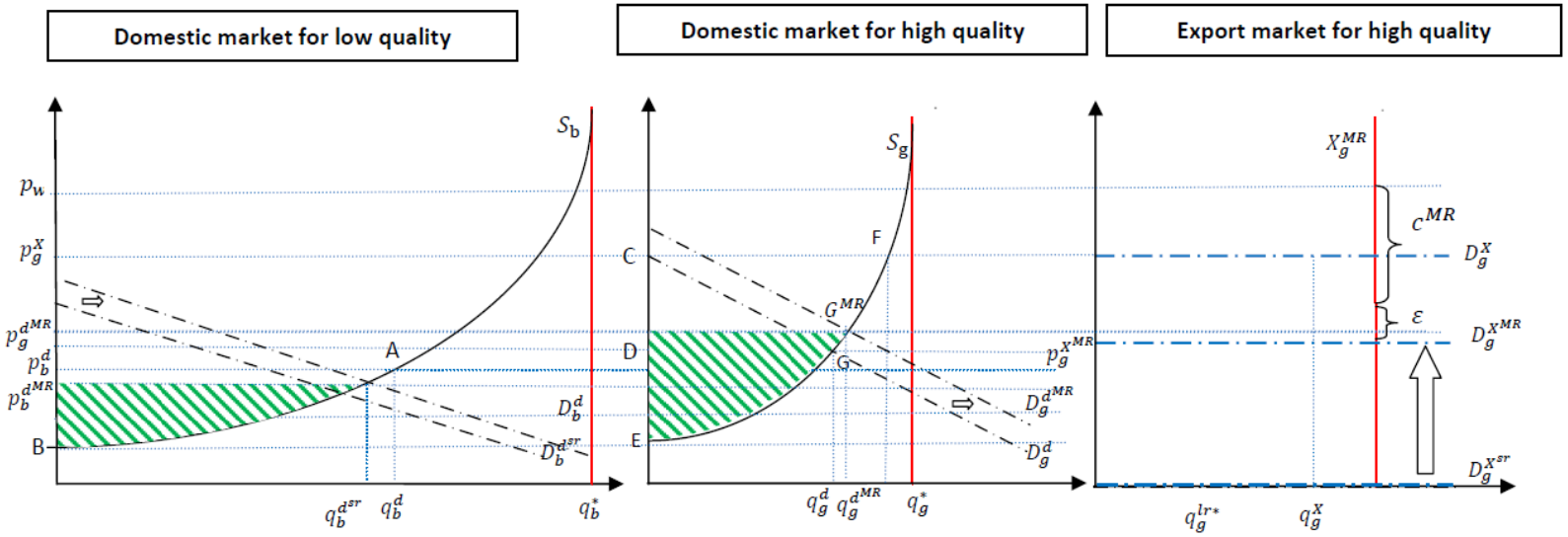


Figure A:
Open-economy, demand-supply framework for the market for fresh shrimp in Benin

ENDNOTES

[1] HACCP is a systematic preventive approach to food safety that addresses physical, chemical, and biological hazards. The system is used at all stages of the food-production and preparation processes; including packaging and distribution, in order to assure traceability of hazards throughout the entire supply chain.

[2] Other observers have noted that the new landscape of stringent and rapidly evolving standards may instead provide opportunities for developing countries to upgrade their export sectors by means of increased foreign direct investment and vertical integration (e.g., Jaffee and Henson, 2005; Henson and Jaffee, 2006). For example, in order to comply with standards, domestic or multinational firms involved in food exports from a developing country may invest more resources, interact more with the local small-scale producers, and provide them with inputs and technology (Gow and Swinnen, 1998; Maertens and Swinnen, 2009). Besides, stringent standards may act as a catalyst to stimulate cooperation and inclusive institutions in exporting countries (Colslovsky, 2013).

[3] For instance, Yunus (2009) estimates the short-run cost of the 1997 EU ban on Bangladesh shrimp export at $25 million but estimates the gain at $18 million in the first year and additional yearly gains of $35 million starting from the second year. Keizire (2004) and Henson and Mitullah (2004) reach similar qualitative conclusions for the impact of an EU ban on the fishery export sector of Uganda and Kenya, respectively.

[4] The ban was actually self-imposed by the Beninese government under pressure by the EU. See Section 2 for details.

[5] RASFF enables member countries to share information about the risks related to food and feed items in real time. The legal basis for the RASFF was put into place in 2002, but the system has been in operation since 1979. Current members of RASFF include all of the EU Member States along with Iceland and Liechtenstein. The number of notifications in RASFF has increased over time. Over the period 2003-2011,

for instance, the number of alert notifications increased from 452 to 617 while information notifications and border rejections increased from 302 to 1,253 and from 1,550 to 1,816 respectively (European Commission, 2010 and 2011).

[6] This species represents more than 97% of the total shrimp production of the country and is also caught in other West African countries such as Cote d'Ivoire, Senegal, Cameroon and Nigeria.

[7] The shrimp lay their eggs in the sea. The larvae grow in the sea till about 7 to 8 mm and then migrate to the brackish water in the lagoon during the dry season when the inland water level is low (from January till March). The shrimp mature in the inland water and migrate back to the sea when the salinity of the inland water has decreased and the water level has increased after the rainy season (around July-August). By that time, the shrimp have grown to a length of about 10 cm (Cummings, 1961; Hoestlandt, 1966).

[8] Lake Nohoué is the biggest contributor to the supply of shrimp. According to data reported by Allegre and Dupret (2010), its share is estimated at about 2/3 of the total shrimp supply, the combined share of Lake Ahémé and the Lagoon of Porto Novo is 1/6. The remaining 1/6 stems from other small lakes around the Djegbadji region.

[9] Since this was a self-imposed ban and not a suspension officially imposed by the EU, Benin remained officially on the list of countries that could export fishery products to EU.

[10] The location of TPs around the lake should allow fishermen to reach a TP within less than an hour and a half. At the site of the CUs, ice ought to be produced in order to refill the containers used by collectors and fishermen. The infrastructure works at Lake Ahémé, financed by Belgian Technical Co-operation, were completed in 2010 (Beyens, 2010). Four TPs are still under construction in the lagoon of Porto Novo with financial support of the government and several donors.

[11] See the Commission Decision 2009/951/UE of December 14, 2009. Each of the three exporting firms (CRUSTAMER, FSG and DIAX) also obtained DG SANCO's approval to export fishery products to the EU on December 18, 2009 (SFP, 2010). Prior to Decision 2009/951/UE, Benin was operating under Decision

2076/2005/CE, such that the country could export fishery products under bilateral agreements with four EU countries: Belgium, France, The Netherlands and Spain.

[12] We do not present the welfare analysis for fishmongers, but the effects go in the same directions as those of the fishermen

[13] The question were "open" in the sense that we did not present answer categories to the respondents. We did however ask the enumerators to code the answers, making use of a set of codes and potential answers that were listed on the questionnaire. These codes included a code for "other". The answers in this miscellaneous category were coded after data-entry.

[14] The survey reveals that 20% of fishermen and 24% of fishmongers in our sample had received a training on good practices in the shrimp sector. This is a non-negligible proportion, certainly given the fact that after the training, these individuals may share whatever they have learnt with their fellow villagers.

[15] The Houedah is a group which is competing for the fishery resources with the Goun and the Tofin, which are different but related groups speaking different dialects belonging to the same family of Gbe languages (Hounkpati, 1991).

[16] Fishmongers involved in the shrimp sector at the time of the ban also faced a larger negative income effect, but not significantly so. This may indicate that fishmongers find it relatively easy to switch across species, e.g. by replacing shrimp trading by fish trading. In contrast, fishermen may find this more difficult as the fishing gear they possess may not be readily used across all species. For instance, while the medokpokonou is used for shrimp fishing, it is less suited for fish fishing.

[xvii] From our interviews with the exporting firms' managers, we learned that the largest of the four firms is the market leader and sets the price when the shrimp season starts. The other firms follow. Data reported by PASP (2007) and information derived from our fieldwork indicate that, prior to the ban p_g^X was set at about 2 euro per kg, while the exporting firms received a price p_w of about 6.5 euro per kg. Thus, $p_w - p_g^X$, was 4.5 euro per kg and we can hypothesize that $c + \varepsilon \leq 4.5$ euro.

[xviii] It is possible that some fishermen sell the high quality shrimp to local consumers, but this amount would be very small compared to the quantity supplied to exporting firms. Therefore, the model normalizes the amount of the high quality of shrimp sold to local consumers to zero.